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ABSTRACT

Programed instruction, as compared with conventional classroom teaching, is more effective for the students who belong to a lower social economic status (SES) than for other students. This hypothesis was tested and supported by a study conducted in a suburban school of Montreal. One hundred-five students in grade 9, registered for a biology course, were taken as subjects. The experimental group, consisting of 62 students, read "Life: The Key to Life," a linear programed textbook. The control group of 43 students were taught the same text material by the biology teacher in the usual way. The experiment continued for four weeks. A 2x2 multivariate analysis of covariance design was used for analysis of the data, using two instructional methods and two levels of SES as independent variables, posttest scores on the two achievement tests as dependent variables, and chemistry grade, SCAT-Quantitative, and two pretest scores as covariates. Although the results of the study cannot be generalized, they are very encouraging. It is planned to replicate the study on a much larger sample, at different grade levels, and in different subject areas. The results of the final studies are expected to be very useful for the improvement of individual instructions. (Author/RT)

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In the past few years, numerous researches have been made with programed instruction at various levels of education. The results of many studies are still inconclusive. As Schramm's (1962), (1964) reviews of various studies have indicated, superiority of programed devices over traditional classroom methods has not been clearly established.

Hoffmeister (1966) has summarized published research on three learning variables in programed instruction, the program, the presentation mode, and the learner: The reported studies of program variables and of presentation mode showed inconclusive differences. However, some learner variables appeared good predictors of learning with a program.

Strang (1964) concluded from his survey of research studies in programed instruction that greater effort should be expended in relating intellectual, emotional and motivational variables to various types of program structures.

The above studies and many others suggest that the inconclusive findings may result in part from failure to consider non-intellective characteristics of the learner in the instructional situations, and that future studies of the effectiveness of programed instruction should take care to consider characteristics of the learner as they influence the criterion data.

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The effectiveness of programmed instruction was investigated by Suty and Suty (1964) in relation to five student characteristics; cumulative grade-point average (GPA), anxiety, achievement need, social need, and attitude toward programmed instruction. Significant correlations were obtained between scores on an achievement test over the programmed unit and GPA, anxiety, and social need. When effects of GPA were partialed out, significant correlations were observed between achievement on programmed instruction and social need, suggesting that the latter may be an important variable in the programmed learning situation.

Tosmook (1964) analyzed various personality factors in fourth-grade learners in relation to their achievement in programmed instruction. The Lennon Anxiety Scales and the California Test of Personality were used to identify the personality characteristics. The results suggested that successful learners had tendencies to be more withdrawn and less self-reliant, and that they showed more signs of test anxiety than did unsuccessful learners. These students whose personality test reports indicated poorer adjustment achieved beyond their expected performance.

The studies of Suty and of Tosmook used programmed material alone and did not compare the data with those involving other methods of instruction.

Elyon and Steyer (1964) designed a study to assess the relationship of learner anxiety to the effectiveness of programmed instruction. They controlled the influence of student intelligence and of achievement prior to instruction. The Test Anxiety Questionnaire, High School Form, developed by Judith Lunn, was used to divide the students into three levels of anxiety-high, moderate, and low. Participants in the study were largely sophomores. The authors note that student achievement did not differ significantly over levels of test anxiety. Applying a different technique for analyzing data, they obtained evidence that appears to be contradictory to the results reported by Tosmook with respect to the relationship between anxiety and achievement with programmed instruction.

Buxton's (1956) review of studies of teaching methods concerns that the effectiveness of different methods of instruction varies with individual differences in personality characteristics such as intelligence, background, motivation, self-concept, self-confidence and emotional adjustment.

Gooch (1968) conducted a study that takes into account both personality and situational factors. He studied the relationship between sociability and academic achievement in four different kinds of learning situations: a lecture class, a discussion group with instructor, a leaderless discussion group, and an independent study group. He concluded that students with high sociability perform better in class situations in which interaction is more frequent (discussion groups), while students who are not sociable perform better in situations in which interaction is at a minimum (the lecture class). Finally it is noticed that the students belonging to a lower SES are less sociable than the students who belong to a higher SES.

The present study explores the possibility that individuals coming from a home of low socioeconomic level can learn more effectively in a classroom situation where the method of instruction is less threatening to the individual than in the traditional classroom situation. It is suggested that programmed instruction learning situation has minimum interaction with others and is therefore less threatening than traditional classroom instruction, and that achievement of students belonging to a lower SES will be greater when the instructional method has minimum interaction and is less threatening. Also programmed instruction does not require any home work assignment and it will be in the favor of lower SES students who do not have enough books at home and do not get much tutorial help from their parents.

More specifically, the purpose of this study, therefore, is to investigate possible relationships between socioeconomic status (SES) of learners and their achievement when programmed instruction and conventional classroom techniques are employed.

METHOD

The study was conducted in a suburban school of Honolulu. One hundred five students in grade 7 registered for a biology course, were asked to participate. The experimental group consisted of 53 students and used "Life: The Key to Life", a linear programmed text-book. The control group of 52 students was taught the same text-material by the biology teacher in the usual way. The experiment continued for four weeks.

A standardized achievement test which came with the programmed text and another achievement test based upon the same text-material but constructed by the teacher, were given to all the subjects as pre-tests to measure the initial knowledge of the subject matter. At the end of the experiment the same tests were given again to both the groups to get achievement scores.

From the school folders, the following information was obtained for each subject: chronology grade, recent IQ(Otis-Quantitative score, and the occupation and education of his father or guardian. Letter grades were converted into numbers. On the basis of Hollingshead's (1957) Two Factor Index of Social Position scores, education and occupation were weighted, and an index of SES was calculated for each individual. The possible range of scores of SES index on a continuum is from a low of 11 to a high of 77. This continuum was broken into a dichotomy at the median to get high and low SES groups.

A 2x2 multivariate analysis of covariance design was used for the analysis of the data, using two instructional methods and two levels of SES as independent variables, post-test scores on the two achievement tests as dependent variables, and chronology grade, IQ(Otis-Quantitative and two pre-test scores as covariates.

RESULTS

The means and standard deviations for all the variables are given in table 1. Call me to issue HIS-experimental group, call two to higher HIS-experimental group, call three to issue HIS-control group, and call four to higher HIS-control group. Higher HIS groups in the experimental as well as in the control groups have higher means than the corresponding means for the lower HIS groups on all the four covariates. The correlations among all the variables are given in table 2. The correlations of the four covariates with the two dependent variables are significant at the .05 level. The correlation between the standardized post-test and the teacher-made post-test is .83. It indicates that the teacher-made achievement test is fairly valid test.

For the standardized post-test, the F-value for regression analysis with 4 covariates is $F(4,97) = 8.31$, $p < .0001$, and for the teacher-made post-test, it is $F(4,97) = 12.78$, $p < .0001$. Also F-value for test of hypothesis of no association between dependent variables and covariates is $F(8,192) = 7.13$, $p < .0001$. It means the four covariates combined are predicting both the dependent variables significantly. Step-wise regression to analyze the contribution of each covariate showed that all the covariates were contributing significantly to the prediction of each dependent variable.

Table 1. [illegible]

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Table 2. [illegible]

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Multivariate and univariate analyses of covariance are given in table 3. The programmed instruction and the traditional instruction groups performed significantly different on the two achievement tests. F-ratio for multivariate test of equality of mean vectors is $F(2,96) = 65.76$, $p < .0001$; Univariate F for the standardized achievement test is $F(1,97) = 36.87$, $p < .0001$; and Univariate F for the teacher-made achievement test is $F(1,97) = 8.88$, $p < .0037$. Looking at the estimated means in table 4, it becomes clear that the programmed instruction group did better on the standardized achievement test while the conventional teaching group did better on the teacher-made achievement test.

There is no significant difference between the achievement of low and high IQI groups either on the standardized achievement test or on the teacher-made achievement test or on both taken together, multivariate $F(2,96) = 0.38$, $p < .68$; for standardized test univariate $F(1,97) = 0.31$, $p < .363$; and for teacher-made test univariate $F(1,97) = 0.61$, $p < 0.436$.

Univariate F-ratios for the methods and IQI interaction are significant at the .1 level of significance, multivariate $F(2,96) = 2.06$, $p < 0.133$; for standardized achievement test $F(1,97) = 2.96$, $p < 0.088$; and for teacher-made achievement test $F(1,97) = 3.45$, $p < 0.066$. In both the achievement tests the estimated means for low IQI group are greater than the estimated means for the high IQI group when the programmed instruction is used while the reverse is true when the conventional teaching is used.

CONCLUSION

The study supports the hypothesis that programmed instruction, as compared with conventional classroom teaching, is more effective for the students who belong to a lower IQI than for other students. Although the results of the study cannot be generalized, due to the several limitations of the study, these are very encouraging. It is planned to replicate the study on a much larger sample, at different grade levels and in different subject areas. The results of the final studies will be very useful for the improvement of traditional instructions.

Table 5. Multivariate and Univariate analysis of covariance, 6 covariates have been eliminated.

Source	Dependent Variables	df	MS	Univariate F	P	Multivariate F(3,963)	P
Methods	Post-test 1	1	363.69	38.87	<.0005	42.76	<.0005
	Post-test 2	1	48.23	8.83	<.0037		
ORI	Post-test 1	1	3.87	0.81	<.369	0.32	<.81
	Post-test 2	1	0.64	0.41	<.638		
Method x ORI	Post-test 1	1	18.89	3.94	<.059	3.03	<.133
	Post-test 2	1	26.33	5.49	<.066		
Error	Post-test 1	87	6.67				
	Post-test 2	87	7.71				

Table 6. Estimated combined means, 6 covariates have been eliminated.

Method	Standardized Achievement Test				Teacher-made Achievement Test		
	Low ORI	High ORI	High & Low ORI Combined		Low ORI	High ORI	High & Low ORI Combined
Programmed instruction	20.30	19.29	19.69		13.06	10.75	11.39
Traditional teaching	15.03	16.19	16.11		12.71	13.58	13.12
Both the methods combined	18.17	17.84			12.38	12.13	

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